

## REMARKS

### Election of Claims

Applicant provisionally elected group 1, claims 1-12, drawn to a composite membrane in a telephone conversation on September 22, 2005. As indicated above and discussed below, claims 13, 17 and 18 are herein amended to depend from claim 1, making all claims depend from claim 1. Thus, Applicant respectfully requests examination of all pending claims on the merits.

### Amendments to the Claims

Claims 1, 4, 6 13, 17 and 18 are herein amended and claim 11 is cancelled. Claim 1 is amended to specify that the middle layer is “covalently bonded to the support layer.” Support for this amendment is found in the specification on p. 9, para. [0031], lines 10-12 (“The first coating solution could be an adhesive, such as epoxy, polyurethane, and silicone, or a polymer solution, which has excellent compatibility with both the support and the membrane *to bond them together*”) and para. [0032], p. 9, lines 3-6 (“Middle layer **22** represents a permeable binding layer, which could be an adhesive, such as epoxy, polyurethane, silicone, *and any other chemical, which provides binding* between the support and the membrane”), emphasis added. Additional support is found in original claim 3. Claim 1 is also amended to specify that the particles are “crosslinked polymeric particles.” Support for this amendment is found in the application in Examples 2 and 3, in paras. e.g. [0038] and [0041], and original claim 6, among other places.

Claim 4 is amended to delete the incorrectly spelled ‘hydrophorbic’ and replace it with the correctly spelled “hydrophobic.”

Claim 6 is amended to delete the phrase “, as well as other crosslinked polymers” and to add the modifier “crosslinked” before every polymeric particle material, for reasons of clarity, and to move “crosslinked” from behind the “poly(4-vinylpyridine) methyl chloride quaternary salt” to in front of “poly(4-vinylpyridine) methyl chloride quaternary salt”, for reasons of clarity. Support for the addition of crosslinked is found as described above, and elsewhere throughout the application.

Claim 11 is cancelled.

Claim 18 is amended to specify a Markush group of filtering steps in place of the original sequential list of filtering steps. Support for this amendment is found in the application in Tables 1 - 3; and Examples 1 - 3, pp. 17-24.

Claims 13 and 16 are amended to depend from claim 1, reciting a membrane "as claimed in claim 1." Support for making claims 13 and 18 dependent on claim 1 by reciting a membrane "as claimed in claim 1" is found throughout the application.

Applicant respectfully submits that these amendments merely add limitations supported in the specification (claim 1); correct a spelling error (claim 4); clarify the claim (claims 6 and 11); and introduce a proper Markush group for clarity (claim 18); and convert independent method claims into dependent methods claims (claims 13 and 18) and, as such, the amendments do not constitute addition of new matter.

#### Claim Rejections-35 USC§ 112, para. 2 – Indefiniteness

As discussed above, claim 4 has been amended to correct the spelling of hydrophobic. Claim 6 has been amended to delete the phrase "as well as other crosslinked polymers." In response to Examiner's assertion that claim 11 is indefinite, claim 11 has been cancelled. Applicant respectfully submits that the pending claims are definite, and request withdrawal of the rejections based on 35 USC§ 112, para. 2.

#### 35 USC § 102(b) Rejections – Anticipation

Claims 1-9 and 12 are rejected under 35 U.S.C. 102 (b) as being anticipated by Mahendran et al (US 5,914,039) (hereinafter '039). As amended, claim 1 requires that the middle layer be covalently bonded to the support layer, and that the polymeric particles be crosslinked. Applicant respectfully submits that the '039 patent does not disclose a middle layer covalently bonded to a support layer of a composite membrane, and does not disclose a distinguishable middle layer at all (see col. 3, lines 52 – 64, "...extruding *the* dope on to the support at a rate sufficient to form *a continuous layer* of dope...", emphasis added). Note the reference in '039 to a single doping material added directly to the support layer (braid) to form a *single continuous layer* on the braid support.

The dope is not added to an adhesive, or other layer already present on the support layer. In the '039 patent, the single continuous layer of dope is added directly to the support layer. It is not covalently bonded to the support layer, and there is no distinct middle layer. In addition, the '039 patent does not teach crosslinked polymeric particles.

Further support for the novelty of claim 1 is found in the attached Declaration under 35 USC § 1.132 by the inventor, Dr. Ji (hereinafter the "Ji Declaration"), paras. 8-33. Applicant therefore respectfully submits that claim 1, and all claims which depend therefrom, are novel over the cited prior art. Reconsideration of the claims and withdrawal of the anticipation rejection under 35 USC § 102(b) are therefore requested.

#### 35 USC § 103(a) Rejections – Obviousness

Claims 10-11 stand rejected for obviousness based on the '039 patent combined with patent '473. Given that the '039 patent, the base reference of the obviousness rejection by the Examiner does not disclose all the elements of the presently claimed membrane (see above), the combinations of '039 with Strobel (US 5,766,473 – hereinafter the '473 patent) to reject claims 10 and 11 and '039 with Cooper (US 3,676,193 – hereinafter the '193 patent) to reject claims 2 and 3 likewise do not teach all the elements of the membrane of claim 1 in the instant application.

Moreover, there is no suggestion in the references themselves, or the knowledge available in the art for the '039/'473 combination. Combining patent '473, which discloses "a supporting structure having a complex geometric configuration and an extremely thin hydrophilic polymer shell" (col. 4, lines 7-10), with patent '039 renders the '039 patent unsatisfactory for its intended purpose. According to MPEP § 2143.01(V) "If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)." Patent '039 states that "The novel membrane provides about 50% higher specific flux than a membrane made with the same polymer but without the  $\alpha$ -Al particles. Unexpectedly, the net flux is improved by treating the membrane with a solution of sodium hypochlorite..." (see Abstract) and "It is critical that the particles be  $\alpha$ -Al which

are basic (pH in the range from about 8 to 10) and that they be added prior to grafting ...” (col. 2, line 67 - col. 3, line 2). There is no suggestion in patent ‘039 or the knowledge in the art to modify the critical aspect of the particles to be a particle other than “ $\alpha$ -Al particles which are basic.”

Because the support structures disclosed in the ‘473 patent are not membranes, there is no requirement for flux, let alone unexpectedly improved net flux through the polymeric shell of the ‘473 patent. Because of the criticality of the  $\alpha$ -Al particles in the ‘039 patent, one skilled in the art would not interchange the ‘039 continuous layer of polyvinylidene fluoride (PVDF) interspersed with  $\alpha$ -Al particles and then grafted with a *hydrophilic* polymer to form a copolymer, with the tactic polymeric shell of the ‘473 patent, uniquely suited for coating the complex geometric configuration of the ‘473 support structure, for fear of losing the unexpectedly improved net flux provided by the unique polymeric copolymer of the ‘039 patent. Even more, because of the criticality of  $\alpha$ -Al particles in the ‘039 patent, one skilled in the art would not interchange these critical particles with a different particle, particularly one that does not include aluminum, as in the instantly claimed invention. Whether the shape of the membrane is a sphere or other shape, the combination of ‘039 and ‘473 is not suggested or taught, and does not teach all the elements present in the instant claims. Thus, Applicant respectfully submits that there is no suggestion to make the ‘039/‘473 combination.

Claims 2 and 3 stand rejected for reasons of obviousness based on the ‘039 patent and patent ‘193. Patent ‘193 teaches only a single layer, which impregnates the support material (see col. 3, lines 44-51; claims 1, 8 and 21). In the membrane of instant claim 1, the middle layer is covalently bonded to the support layer, and the particles are crosslinked. Thus, as stated above for the § 103(a) rejection of claim 7, the ‘039/‘193 combination does not teach all the elements of claims 2 and 3.

And as detailed above, combining patent ‘193 with the ‘039 patent renders the ‘039 patent unsatisfactory for its intended purpose, because again, the unexpectedly improved net flux seen with the unique copolymer dispersed with the critical  $\alpha$ -Al particles disclosed in the ‘039 patent would be lost with such a combination. Even with the improved flux the ‘039 patent discloses a flux of only 50 gfd/psi (col. 12, line 2), in

contrast to the flux of as high as 500 gfd/psi claimed in the presently claimed invention. Thus, the best flux disclosed in the '039 patent is about 10 times worse than that of the presently claimed invention.

Moreover, the film layer in patent '193 impregnates the support layer, whereas in patent '039, the copolymeric dope is applied to the support layer by "extruding the dope *on* to the support" (col. 3, lines 59-60, emphasis added) not *into* the support.

Thus, there is no motivation to combine the '039 patent with the '193 patent, or to modify the '039 patent and/or '193 patent as would be needed to arrive at the presently claimed invention.

As stated in MPEP § 2142:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Because the combinations cited by the Examiner fail to teach or suggest all the elements of the claimed membrane in instant claim 1, and because there is no motivation or suggestion to make the cited combination, or modify the cited art, Applicant respectfully submits that there is no *prima facie* case of obviousness and the claims are patentable over the cited combinations.

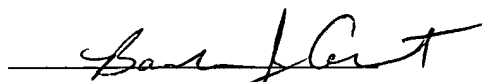
Additional arguments in support of non-obviousness are found in the Ji Declaration, paras. 34-54. Applicant respectfully submits that pending claims 10-11, and 2 and 3 are not obvious. Reconsideration of the claims and withdrawal of the obviousness rejections under 35 USC § 103(a) are therefore requested.

### CONCLUSION

For the reasons set forth above, it is submitted that all pending claims are in condition for allowance. Reconsideration of the claims and a notice of allowance are therefore requested. It is believed that no extension of time is required for this matter. Applicant hereby submits this conditional petition for an extension of time, if needed, and requests that any fee required for timely consideration of this application be charged to Deposit Account No. 19-4972.

If the Examiner has any questions as to the allowability of the currently pending claims or if there are any defects which need to be corrected, the Examiner is invited to speak to the Applicant's counsel at the telephone number given below.

Respectfully submitted,



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